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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/674,594  
Filing Date: September 29, 2003  
Appellant(s): VERNSTROM ET AL.

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Philip Y. Dahl  
For Appellant

**EXAMINER'S ANSWER**

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This is in response to the appeal brief filed 20 July 2007 appealing from the Office action mailed 3 July 2007.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Debe et al. (5,879,827).

**Claim 1:** Debe et al. disclose a fuel cell cathode catalyst comprising nanostructured elements which comprise microstructured support whiskers bearing nanoscopic catalyst particles, the nanoscopic catalyst particles made by alternating application of first and second layers (abstract) comprising platinum, iron and second metal selected from the group consisting of Group VIb metals, Group VIIb metals and Group VIIIb metals (col. 10: 14-36).

Debe et al. do not specifically disclose

a first layer comprising platinum and a second layer being an alloy or intimate mixture of iron and a second metal selected from the group consisting of Group VIb metals, Group VIIb metals and Group VIIIb metals other than platinum and iron,

where the atomic ratio of iron to the second metal in the second layer is between 0 and 10,

where the planar equivalent thickness ratio of the first layer to the second layer is between 0.3 and 5, and

wherein the average bilayer planar equivalent thickness of the first and second layers is less than 100 Å.

However, Debe et al. disclose, "The catalyst particles of the present invention may have alternating layers of different catalyst materials which may differ in composition, in degree of alloying or in degree of crystallinity. By varying the thicknesses of the individual layers the stoichiometry of the bulk and the degree of alloying can be changed. By controlling which deposition sources are on or off and how much power is provided to the deposition sources during the final passes of the substrate in front of the sources, the surface composition can be controlled. The surface composition of the catalyst particle can have a different composition than the bulk composition of the particle." See col. 4: 27-40.

Further, Debe et al. disclose, "The process and apparatus of the present invention allow selective modification of the stoichiometry, degree of alloying, degree of crystallinity and crystallite morphology of the bulk of the catalyst coating as well as the surface composition. These can be changed by varying the relative deposition rates of the individual layers, by varying the power, throw distance, or duration of any of the sources. Furthermore, the composition and structure of the catalyst can be altered by including additional components in the sputtering gas. Any known sputtering gas additives may be used, reactive or unreactive with the deposited material and whether incorporated into the catalyst as a constituent or dopant or not. Additives may include noble gasses, halogens, group VII elements, and preferably argon and oxygen. If sufficient isolation of the different vacuum deposition stations is

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provided, layered mixtures can be created which incorporate additives only in selected layers or which incorporate different additives in different layers.” See col. 14: 52-61. See also col. 10: 14-36 and 55-59, col. 10: 63-col. 11: 3, and col. 12: 43-col. 13: 17.

Therefore, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., which are similar to those instantly disclosed, to provide the claimed first and second layer compositions, atomic ratio, planar equivalent thickness, average bilayer planar equivalent thickness.

**Claim 2:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., which are similar to those instantly disclosed, to provide a planar equivalent thickness ratio of the first layer to the second layer between 0.3 and 2.5, and wherein the average bilayer planar equivalent thickness of the first and second layers is greater than 8 Å.

**Claim 3:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., which are similar to those instantly disclosed, to provide an atomic ratio of iron to the second metal in the second layer between 0.01 and 10.

**Claim 4:** Debe et al. on col. 10: 25 disclose a metal selected from the group consisting of nickel, cobalt and manganese. As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the

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invention was made to have modified the method and apparatus of Debe et al., to provide a second metal selected from the group consisting of nickel, cobalt and manganese.

**Claim 5:** The rejection of claim 5 is as set forth above in claim 4.

**Claim 6:** Debe et al. on col. 10: 25 disclose a metal selected from the group consisting of nickel. As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide a second metal selected from nickel.

**Claim 7:** The rejection of claim 7 is as set forth above in claim 2.

**Claim 8:** The rejection of claim 8 is as set forth above in claim 6.

**Claim 9:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide an atomic ratio of iron to nickel in second layer between 0.01 and 0.4.

**Claim 10:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide an atomic ratio of iron to nickel in the second layer is between 0.01 and 0.15.

**Claim 11:** Debe et al. on col. 10: 25 disclose a metal selected from the group consisting of cobalt. As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to

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have modified the method and apparatus of Debe et al., to provide a second metal selected from cobalt.

**Claim 12:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide a planar equivalent thickness ratio of the first layer to the second layer between 0.3 and 2.5, and wherein the average bilayer planar equivalent thickness of the first and second layers is greater than 8 Å.

**Claim 13:** The rejection of claim 13 is as set forth above in claim 11.

**Claim 14:** The rejection of claim 14 is as set forth above in claim 12.

**Claim 15:** Debe et al. on col. 10: 25 disclose a metal selected from the group consisting of manganese. As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide a second metal selected from manganese.

**Claim 16:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., to provide an average bilayer planar equivalent thickness of the first and second layers of greater than 8 Å.

**Claim 17:** The rejection of claim 17 is as set forth above in claim 15.

**Claim 18:** As set forth above in claim 1, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was



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made to have modified the method and apparatus of Debe et al., to provide an planar equivalent thickness ratio of the first layer to the second layer between 1.25 and 5.

**Claim 19:** Debe et al. disclose a method of making a fuel cell cathode catalyst comprising nanostructured elements which comprise microstructured support whiskers bearing nanoscopic catalyst particles, the nanoscopic catalyst particles made by alternating application of first and second layers (abstract) comprising platinum, iron and second metal selected from the group consisting of Group VIb metals, Group VIIb metals and Group VIIIb metals (col. 10: 14-36).

Debe et al. do not specifically disclose

a first layer comprising platinum and a second layer being an alloy or intimate mixture of iron and a second metal selected from the group consisting of Group VIb metals, Group VIIb metals and Group VIIIb metals other than platinum and iron,

where the atomic ratio of iron to the second metal in the second layer is between 0 and 10,

where the planar equivalent thickness ratio of the first layer to the second layer is between 0.3 and 5, and

wherein the average bilayer planar equivalent thickness of the first and second layers is less than 100 Å.

However, Debe et al. disclose, "The catalyst particles of the present invention may have alternating layers of different catalyst materials which may differ in composition, in degree of alloying or in degree of crystallinity. By varying the thicknesses of the individual layers the stoichiometry of the bulk and the degree of alloying can be changed. By controlling which

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deposition sources are on or off and how much power is provided to the deposition sources during the final passes of the substrate in front of the sources, the surface composition can be controlled. The surface composition of the catalyst particle can have a different composition than the bulk composition of the particle.” See col. 4: 27-40.

Further, Debe et al. disclose, “The process and apparatus of the present invention allow selective modification of the stoichiometry, degree of alloying, degree of crystallinity and crystallite morphology of the bulk of the catalyst coating as well as the surface composition. These can be changed by varying the relative deposition rates of the individual layers, by varying the power, throw distance, or duration of any of the sources. Furthermore, the composition and structure of the catalyst can be altered by including additional components in the sputtering gas. Any known sputtering gas additives may be used, reactive or unreactive with the deposited material and whether incorporated into the catalyst as a constituent or dopant or not. Additives may include noble gasses, halogens, group VII elements, and preferably argon and oxygen. If sufficient isolation of the different vacuum deposition stations is provided, layered mixtures can be created which incorporate additives only in selected layers or which incorporate different additives in different layers.” See col. 14: 52-61. See also col. 10: 14-36 and 55-59, col. 10: 63-col. 11: 3, and col. 12: 43-col. 13: 17.

Therefore, in light of the teachings of Debe et al., it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., which are similar to those instantly disclosed, to provide the claimed first and second layer compositions, atomic ratio, planar equivalent thickness, average bilayer planar equivalent thickness.

**Claim 20:** Debe et al. disclose on col. 13: 48-50 that vacuum deposition steps are carried out substantially in the absence of oxygen.

**Claim 21:** Debe et al. disclose that the platinum and the alloy or intimate mixture of iron and a second metal are deposited on microstructured support whiskers (abs.).

**Claim 22:** Debe et al. disclose that second metal is selected from the group consisting of nickel, cobalt and manganese (col. 10: 25).

**Claim 23:** Debe et al. disclose that second metal is nickel (col. 10: 25).

**Claim 24:** Debe et al. disclose a step of removing at least a portion of said alloy or intimate mixture of two metals after said deposition steps (col. 8: 30-47).

**Claim 25:** Debe et al. disclose a fuel cell cathode catalyst comprising nanoscopic catalyst particles made according to the method as set forth above in claims 23 and 19.

#### **(10) Response to Argument**

The Applicants argue, “In the present case, no prima facie case of obviousness have been established because the cited reference fails to teach or suggest claim limitations recited in the present claims”.

In response, the claim limitations are suggested in light of the teachings of Debe et al. as cited on col. 4: 27-52 and col. 14: 52-col. 15: 2.

In particular, Debe et al. disclose, “...The nanostructured elements comprise acicular microstructured support whiskers bearing acicular nanoscopic catalyst particles which may comprise alternating layers of catalyst materials, which may comprise a surface layer that differs in composition from the bulk composition of the catalyst particles...” *See abstract.*

In col. 4: 28-40, Debe et al. disclose, "...The catalyst particles of the present invention may have alternating layers of different catalyst materials which may differ in composition, in degree of alloying or in degree of crystallinity. By varying the thicknesses of the individual layers the stoichiometry of the bulk and the degree of alloying can be changed. By controlling which deposition sources are on or off and how much power is provided to the deposition sources during the final passes of the substrate in front of the sources, the surface composition can be controlled. The surface composition of the catalyst particle can have a different composition than the bulk composition of the particle."

In col. 10: 14-36, Debe et al. disclose, "...metals (e.g., noble metals such as gold, silver, platinum, osmium, iridium, palladium, ruthenium, rhodium, and combinations thereof; transition metals such as scandium, vanadium, chromium, manganese, cobalt, nickel, copper, zirconium, and combinations thereof; low melting metals such as bismuth, lead, indium, antimony, tin, zinc, and aluminum; refractory metals such as tungsten, rhenium, tantalum, molybdenum, and combinations thereof)". This disclosure encompasses Group VIb, Group VIIb, and Group VIIIb required by the claimed invention. And, although iron (Fe) is not explicitly disclosed, one skilled in the art would know that transition metals encompasses iron. Furthermore, instant claim 1 recites, "...where the atomic ratio of iron to said second metal in the second layer is between 0 and 10...". Consequently, iron is not required in the catalyst.

On col. 10: 63-col. 11: 3, Debe et al. disclose, "...the coating may be deposited onto the microstructured layer by vapor phase deposition methods, such as, for example, ion sputter deposition, cathodic arc deposition, vapor condensation, vacuum sublimation, physical vapor transport, chemical vapor transport, and metalorganic chemical vapor deposition. Preferably,

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the conformal coating material is a catalytic metal or metal alloy.” And on col. 11: 38-39, Debe et al. disclose, “In the present invention, vacuum deposition may be accomplished by any suitable means known in the art.”

On col. 14: 52-58, Debe et al. disclose, “The process and apparatus of the present invention allow selective modification of the stoichiometry, degree of alloying, degree of crystallinity and crystallite morphology of the bulk of the catalyst coating as well as the surface composition. These can be changed by varying the relative deposition rates of the individual layers, by varying the power, throw distance, or duration of any of the sources...”

In light of the teachings of Debe et al., it would have been within the skill of, or obvious to, one having ordinary skill in the art at the time the invention was made to have modified the method and apparatus of Debe et al., which are similar to those instantly disclosed, to provide the claimed limitations (see also col. 10: 14-36 and 55-59, col. 10: 63-col. 11: 3 and col. 12: 43-col. 13:17).

The Applicants also argue, “The Examples of the present application (Specification at pages 7-14) include numerous demonstrations (Tables 1-8) of oxygen metric measurements for catalysts according to the present invention along with similar oxygen metric measurements for comparative catalysts (labeled “C”). The Examples demonstrate the distinct and superior performance exhibited by the catalyst according to the present invention.

In response, it is unclear from the table what the catalyst composition of the comparative is (it is assumed that the composition of the comparative is the same as that of the Example). Further, the table does not appear to provide a comparison of the comparative with the Examples

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at the same thickness. The instant specification states that the catalysts were manufactured according to the methods disclosed in Debe et al. Assuming that the catalyst of the comparative and the Examples were the same composition and manufactured according to method of Debe et al., it is unclear from the table as to why there is a difference in the O<sub>2</sub> metric current density.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.



Respectfully submitted,

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*Appeals Specialist*